600 INCIDENTALS

ITEM 601 - SLOPE AND CHANNEL PROTECTION

601.04 Riprap

601.07 Dumped Rock Fill

601.08 Rock Channel Protection

601.04 Riprap. This shall consist of flat stones, precast concrete blocks or broken concrete roughly rectangular in cross section, not less than 1/3 cubic foot (0.01m³) in volume nor less than three inches (75mm) thick. The individual pieces shall be placed by hand, one upon the other so that they will break joints with the piece in the course below. They shall be placed with their flat surfaces roughly perpendicular to the slope and forming contact with the courses immediately below and above.

The space between the larger pieces shall be filled with spalls rammed into place.

The surface of the finished riprap slope shall not vary more than three inches (75mm) from that shown on the Plans, and shall present an even, tight surface, pleasing in appearance.

When required by the Plans, the riprap shall be grout filled.

The backing shall be compacted as the construction of the riprap progresses, in layers not more than six inches (150mm) thick.

The thickness of the riprap, measured perpendicular to the slope, shall be not less than nine inches (230mm) and shall average not less than 12 inches (0.25m).

601.07 Dumped Rock Fill.

The following sentence shall be added to the first paragraph:

The completed dumped rock fill shall be of the thickness shown on the Plans.

601.08 Rock Channel Protection.

The following sentence shall be added to this section:

The completed dumped rock channel protection shall be of the thickness shown on the Plans.

ITEM 602 - MASONRY

602.01 Description

602.03 General

602.01 Description. This work shall consist of furnishing all materials and constructing headwalls, key blocks, pipe cradles, collars and other masonry of the type and size specified.

602.03 General.

The fifth paragraph shall be changed as follows:

If the material found at grade is not suitable for foundation, a further depth shall be excavated to provide a suitable foundation, and filled with suitable material. Payment for additional excavation and backfill shall be as specified in 603.03.

The eighth paragraph shall be changed as follows:

Concrete headwalls, concrete cradles and other concrete masonry shall be constructed of the materials and by the methods as described under 499 and 511, and shall be of the Class shown on the Standard Drawings or of Class C. Reinforcing steel shall be placed as prescribed under 509.

The last paragraph shall be changed as follows:

Block or brick walls shall be of the thickness called for on the plans. Blocks or bricks shall be thoroughly wetted before laying in mortar. They shall be laid up with full mortar joints. The mortar shall be composed of one part of portland cement to two parts of sand by volume. The materials shall be mixed dry until the color is uniform, then water shall be added and mixing continued until a stiff homogeneous mass is produced. All mortar shall be thoroughly mixed in suitable water tight boxes or in approved mechanical mixers. Mortar shall be mixed in small quantities so that each batch may be used before it has taken its initial set. No lime whatever shall be used in the mortar, and the use of retempered mortar will not be permitted. Retempered mortar is that which has been remixed with or without the addition of water after the initial set has taken place.

The following paragraphs shall be added:

Water for mixing mortar and wetting blocks or bricks shall be Cincinnati hydrant water or equal.

After the excavation has been made, and the sides securely supported where necessary, the bottom of the excavation shall be carefully hand-trimmed and shaped to conform to the outside of proposed structure. The foundation shall be solid and entirely free from mud and water before laying of the block or brick is commenced. All block or brick used in the Work shall be clean and entirely free from dirt, paint, grease and all other foreign substances.

A layer of mortar one-half inch (12mm) thick shall be spread upon the prepared foundation, in which clean wet block or brick shall be set. Each successive course of block or brick shall also be laid in a full bed of mortar. All block or brick shall be laid truly horizontal except in such structures that are built to a fixed grade.

In general, block or brick shall be laid with push joints, all of which shall be close and entirely filled with mortar. All block or brick shall be laid with broken joints both on the sides and with the course below, and the masonry shall be thoroughly bonded together. Only whole block or brick shall be used in the masonry, bats being used only to fill interstices and to effect closures. Exposed surfaces shall be smooth and even with joints neatly pointed up and thoroughly cleaned of all surplus mortar except where they are to be plastered. Surfaces that are to be plastered shall first be thoroughly cleaned and wetted, then plastered before the masonry has set, and troweled to a dense even finish.

ITEM 603 - PIPE CULVERTS, SEWERS AND DRAINS

603.01 Description. This work shall consist of the construction or reconstruction of pipe culverts, sewers, and drains hereinafter referred to as Type A, Type B, Type C, Type D, Type E, Type F, Type G, Type H and Type I Conduits. The work shall be in accordance with these specifications and in conformity with the lines and grades shown on the Plans or established by the Engineer. This work shall include: Excavating for pipes and foundations for same, including clearing and grubbing and the removal of all materials necessary for placing the pipe except removals listed separately; furnishing and placing granular or concrete bedding and granular backfill as required; constructing and subsequently removing all necessary cofferdams, cribs and sheeting; pumping and dewatering; sealing or banding all pipe joints where required; furnishing and installing all necessary pipe bends and branches of a type at least equal to the conduit of which they become a part; joining to existing and proposed appurtenances as required; and restoration of disturbed facilities and surfaces.

603.02 Materials. Pipe shall be of the size and kind specified in the Proposal and shown on the Plans, and meet the requirements of the pertinent sections of 706 and 707. When the kind of pipe is not specifically itemized, any of the kinds listed herein under the specified conduit type may be used. Higher strength 706.01 pipe may be furnished where lower strength 706.01 pipe is specified, higher strength 706.02 pipe may be furnished where lower strength 706.01 or 706.02 pipe is specified, 706.03 pipe may be furnished where 706.02 pipe is specified, higher strength 706.04 may be furnished where lower strength 706.04 is specified, and higher strength 706.08 pipe may be furnished where lower strength 706.08 pipe is specified. A thicker steel of the same corrugation profile may be furnished for 707.01, 707.02, 707.03, 707.04, 707.05, 707.06, 707.07, 707.13, or 707.14 conduits where a lesser thickness is permitted or specified.

Specific materials shall be as follows:

Concrete for bedding, collars	
and encasement (Class C)	499 & 511
Reinforcing steel	509.02
Sand for mortar	703.03
Bituminous pipe joint filler	706.10
Granular material for bedding and	
backfilling shall be durable	
gravel, sand, slag or crushed stone	
meeting grading requirements of	310.02
or granulated slag	703.08
or bank run gravel	703.11
Resilient and Flexible gasket joints	
(concrete, sewer and culvert)	706.11
Vitrified clay, B and S	706.12

The kinds of pipe permitted for each of the designated types of conduit shall be as follows:

Type A Conduits

Non-reinforced concrete pipe (Class 3).	706.01
Reinforced concrete pipe (Class II minimum)	706.02
Reinforced concrete pipe with S stirrups	706.15
Reinforced concrete elliptical pipe	
(Class II minimum)	706.04
Reinforced concrete pipe, vitrified clay lined.	706.05
Vitrified clay pipe (extra strength only)	706.08

Structural plate corrugated steel structures	707.03

Type B Conduits

Non-reinforced concrete pipe (Class 3)	706.01
Reinforced concrete pipe (Class II minimum)	706.02
Reinforced concrete pipe with S stirrups.	706.15
Reinforced concrete elliptical pipe (Class II minimum)	706.04
Vitrified clay pipe (extra strength only)	706.08
Plastic Pipe	707.171*
Plastic Pipe	707.19*

*This material is to be used for sanitary and combined sewer only. The material is not to be used when the depth of cover exceeds 35 feet (10m).

Type C Conduits

Non-reinforced concrete pipe (Class 3)	706.01
Reinforced concrete pipe (Class II minimum)	706.02
Reinforced concrete pipe with S stirrups	706.15
Reinforced concrete elliptical pipe (Class II minimum)	706.04
Vitrified clay pipe (extra strength only)	706.08
Plastic Pipe	707.171*
Plastic Pipe	707.19*

*This material is to be used for sanitary and combined sewer only. This material is not to be used when the depth of cover exceeds 35 feet (10m).

Type D Conduits

Non-reinforced concrete pipe (Class 3)	706.01
Reinforced concrete pipe (Class II minimum)	706.02
Reinforced concrete pipe with S stirrups	706.15
Reinforced concrete elliptical pipe (Class II minimum)	706.04
Vitrified clay pipe (extra strength only)	706.08
Galvanized corrugated steel conduits, Type I and II	707.01
Galvanized corrugated (3 x 1) steel conduits	707.02
Structural plate corrugated steel structures	707.03

Type E Conduits

Non-reinforced concrete pipe (Class 3)	706.01
Reinforced concrete pipe (Class II minimum)	706.02
Reinforced concrete elliptical pipe	

(Class II minimum)	706.04
Concrete drain tile (12" [0.3m] and under), extra quality	706.07
Vitrified clay pipe (extra strength)	706.08
Clay drain tile (12" [0.3m] and under), extra quality	706.09
Galvanized corrugated steel conduits, Type I and II	707.01
Galvanized corrugated (3 x 1) steel conduits	707.02
Corrugated aluminum pipe underdrains, without perforations	707.21 or 707.22

Type F Conduits

Galvanized corrugated (2-2/3 x 1/2) steel conduits, Type I and II	707.01
Galvanized corrugated (3 x 1) steel conduits	707.02
Corrugated aluminum alloy pipe underdrains, without perforations	707.21 or 707.22

Type G Conduits

Cast Iron Pipe	707.18
Ductile Iron Pipe	707.20

Type H Conduits (Inlet Connections)

Non-reinforced concrete pipe (Class 3)	706.01
Vitrified clay pipe (extra strength only)	706.08
Reinforced concrete pipe (Class II minimum)	706.02

Type I Conduits (House Drains)

Non-reinforced concrete pipe (Class 3)	706.01
Vitrified clay pipe (extra strength only)	706.08
Plastic Pipe	707.171*
Plastic Pipe	707.19*

*This material is to be used for sanitary and combined sewer only. This material is not to be used when the depth of cover exceeds 30 feet (9m).

603.021 General. The Contractor shall conduct his operations so as to maintain any sewage flow uninterrupted throughout the construction period. Subsurface structures encountered in the prosecution of the work shall be protected and maintained in complete operation unless permission for their removal or relocation is given. Where existing sewers are to be removed, sewage must be handled by the Contractor in the trench or through closed conduits, and not pumped, bailed or flumed over the street surface or in the gutters. Any additional costs involved in maintaining this flow, by

pumping or by any other approved method which is necessary for construction of the project, shall be included in the contract unit price bid for the respective Items of 603 Conduit.

At places where the Plans provide for proposed drainage pipe to be connected to existing pipes, it shall be the responsibility of the Contractor to locate the existing pipe, both as to line and grade, before he starts to lay the proposed pipe. The cost of this operation, and the cost of connecting proposed sewers to existing manholes or sewers shall be included in the Contract unit bid for the pertinent 603 Conduit Item.

Where connections are made between rigid and flexible pipe sections or between pipe sections of different kind or type of end fabrication, whether required by the Plans, arising from permissible use of optional materials, or encountered in connection to existing facilities, the pipe shall be jointed, and the joint shall be sealed if sealing is required by the specifications, by means of a concrete collar, Type A or Type B, as shown on Standard Drawing Acc. No. 49031. Adaptive couplings may be used if the Engineer approves or requires.

When bell and spigot pipe is used, any necessary pipe cut-offs will be made at the spigot end of the length of pipe adjacent to the end length. When tongue and groove pipe is used, the length of pipe adjacent to the end length shall be cut and butt joint formed with a concrete collar, Type A or Type B as shown on Standard Drawing Acc. No. 49031.

Payment for concrete collars, Type A, shall be included in the Contract unit price bid for the pertinent 603 Conduit Item.

Payment for concrete collars, Type B, shall be made under 602 Concrete Masonry unless otherwise provided in the contract.

Plugging or sealing of new pipes where required shall be in accordance with the requirements outlined in 202 for "Plugging or Sealing Sewers". Payment for this work shall be included in the Contract unit price bid for the pertinent 603 Conduit Item.

603.022 House Drains. To obtain a house connection to either an existing sewer that is to remain or to a proposed sewer, a property owner or his agent, at his sole cost, shall furnish all material and labor required to install the house connection from the carrier sewer to a point beyond the limits of roadway construction.

The Contractor must cooperate with the property owner or his agent to give said property owner or his agent ample opportunity to extend said sewer connection from the tee branch or existing sewer to a point beyond roadway construction limits. The necessary house connection shall be installed by the property owner or his agent at no cost to the Contractor, other than the cost of cooperation in scheduling his work, which cost shall be assumed by the Contractor and shall be included in the Contract unit price bid for the various 603 Conduit Items.

All existing house drains which include sanitary, yard, roof, basement or other similar pipe drains, now in use, which are disturbed because of the improvement, shall be replaced by the Contractor. If the existing sewer is to be abandoned, then a satisfactory house connection shall be provided. Payment for this work shall be at the Contract unit price bid for the pertinent 603 Conduit Item.

Any unrecorded active connection to a sewer, encountered in construction, shall be reconnected to the existing or proposed sewers as directed by the Engineer. Payment for this work shall be at the Contract unit price bid for the pertinent 603 Conduit Item.

Where house drains are constructed by the Contractor either by agreement with the property owner or under the Contract, they shall be constructed in accordance with all applicable provisions of 603.

Under usual conditions, the drain shall be laid on a grade of not less than two per cent, and where it crosses the property line, it shall be at a minimum depth of 7 feet (2m) measured down from the curb grade to the flow line. When it is intended that the house drains serve low lying lots or deep cellars, the house drain shall be deeper than the usual case cited above. The Contractor's attention is called to the requirements of the Cincinnati Building Code concerning house drains.

In case the depth of the main sewer or the grade of the cellar is such that the depth of the house drain must be varied from the above figure of 7 feet (2m), special directions will be given regarding construction of the house drain. House drains shall be laid as illustrated on Standard Drawing Acc. No. 49033. The excavation for the stack or riser shall be carried beyond the sewer trench into firm ground in a trench or slot, which shall be a minimum of 20 inches square (500mm x 500mm).

The stack or riser shall be encased in a minimum of 6 inches (150mm) of Class C concrete or 4 inches (100mm) of brick masonry.

The Contractor shall defer backfilling house drains until the Inspector obtains the elevation at the end of the house drain or the vertical distance from the invert of the house drain to the invert of the main sewer.

The open ends of all unconnected house drains shall be sealed with stoneware stoppers properly cemented into place. The location of the ends of house drains shall be marked with wood strips not less than 2 inches by 6 inches (50mm x 150mm) in cross section and extending vertically from the end of the drain to a point 24 inches (600mm) above the sidewalk grade. If at any time during construction the wood strips are broken or not apparent, the Contractor shall uncover and replace them. When the sidewalk spaces and slopes are fine graded, these strips shall be cut off 2 inches (50mm) below the finished grade. When the sewer branches are installed as part of a private improvement, as in the development of a subdivision, the wood strips shall be installed as above and must be protected in place until final inspection has been made of the improvement, at which time they may be cut down to ground level.

603.023 T and Y-Branches. Straight pipe with T-branches shall be laid where directed by the Engineer in strict accordance with the provisions of Section 603. In laying the pipe, the T-branches shall be inclined upward at an angle of about 45 degrees. Unconnected T-branches shall be sealed with stoneware stoppers properly cemented into place with the use of plastic pipe, unconnected T-branches shall be sealed using a stub and cap.

The Contractor shall keep an accurate record of the locations of all T-branches which shall be furnished to the Engineer upon request.

When it is necessary that a branch leave the main sewer at an angle of more than 20 degrees from the perpendicular, the use of a Y-branch is encouraged. When there is a head end manhole at the terminus of a street requiring several branches to enter the sewer at various angles, the use of Y-branches will be required. In no event, however, will house drains be permitted to enter a manhole unless specific permission to do so has been granted by the Engineer. When such permission is granted, the drain shall enter through the bench the same as other sewers.

603.024 Bends. Vitrified clay, plastic, or concrete bends, curves and elbows shall be installed where required or as directed in laying or reconnecting house drains and in the construction of stacks. These specials shall be furnished and installed in strict conformance with the applicable provisions of 603.

603.025 Plastic Pipe.

All pipe shall be certified by the Manufacturer to meet the applicable ASTM specification requirements. Certification forms, together with a report of the test results shall be provided the inspector/engineer with pipe deliveries and copies

shall be forwarded to the Engineer or the owner. Certification forms shall include project name, location, Contractor, and the test lot number. Lot size shall be acceptable to the Engineer.

All pipe and fittings shall be suitably marked to provide manufacturer's name, lot or production number, ASTM designation, ABS or PVC, and nominal diameter. Pipe shall have a "home" mark. Fittings need not contain lot or production number.

Flexible manhole joints shall be used with this pipe type.

All fittings used for 6 inches (150mm) connections shall be Wye only fittings or approved saddles.

603.026 Backfilling

Pipe shall be installed in full compliance with the Recommended Practice for "Underground Installation of Flexible Thermoplastic Sewer Pipe," ASTM Designation D-2321 - latest edition.

In addition to the construction and testing procedures outlined in other sections of the specifications, the Contractor shall be required to install the pipe in such a manner so that the deflection of the pipe shall not exceed 5% and the materials surrounding the pipe shall be compacted to not less than 90% Proctor. The area requiring compaction shall include the bed and sidefill material and also the material placed above the pipe for a distance of 12 inches (300mm) over the top of the pipe. The Engineer may require up to 10 random compaction tests to be conducted by an independent laboratory.

If any of these tests indicate that the material has not been compacted to the required density, the Contractor shall recompact said material at no additional cost to the Owner and the Engineer shall then have the right to require additional compaction to the proper density without any additional cost to the owner.

603.027 Allowable Bedding and Initial Backfill Types

Class I - Angular 6 to 40mm (1/4 to 1/2") graded stone, including a number of fill materials such as coral, slag, cinders, crushed stone, crushed shells, and shells. Where any ungraded (one size aggregate) crushed stone, coral, or slag is used, limit size to 20 mm (3/4") maximum. This material shall be used when the depth of cover on the conduit is between 4m (14 feet) and 11m (35 feet).

Class II - Coarse sands and gravels with maximum particle size of 40 mm (1-1/2") including various graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Type GW, GP, SW and SP are included in this class as spelled out in ASTM D-2487. This material shall be used for conduits when the depth of cover is 14 feet (4m) or less.

603.028 Deflection Testing

The Contractor shall provide all equipment (including mandrel) and materials and do all work necessary to conduct tests to determine any structural problems with the installed gravity sewer line.

The Contractor shall perform a pipe deflection test on all gravity sewer pipe installed. The maximum limits of ring deflection shall be 5% of the base inside diameter. In any area where deflections exceed 5%, the trench shall be re-excavated, the pipe zone backfill and embedment shall be removed and replaced in accordance with the original specifications. If in the opinion of the Engineer, the pipe has been damaged, the pipe shall be removed and replaced with new pipe and installed in full accordance with the specifications.

All pipelines shall be measured for vertical ring deflection no earlier than 30 days after completion of the backfill.

The deflection probes will be manufactured in accordance with the respective ASTM Specification dimensions.

Equipment used in the tests shall be a nine arm mandrel having a diameter equal to 95% of the base diameter of the pipe as established in ASTM-D-3034. The test shall be performed without mechanical pulling devices.

603.029 Video Taping Completed Storm Sewers

The Contractor on all contracts, permits and subdivisions shall provide a professionally prepared video tape of the inside of all new storm sewers. The video tape shall be in color with clear definition. This requirement does not apply to storm sewer connection pipes to inlets less than 33 feet (10m) long.

The video tape shall show a clean storm sewer in conformance with the specifications. The video tape shall be generated after backfilling and after any operations that would allow substantial construction residue to be carried into the completed sewer. Any retaping needed shall be at the Contractor's expense.

The Contractor shall review the video tape with the Engineer.

All work under this item shall be done by the Contractor without cost to the City and shall be included in the price bid for the various items of work.

603.03 Excavation. Excavation shall cover the loosening, handling, rehandling, removal, filling and disposal of any and all materials, wet or dry, including gumbo, quicksand, hardpan, shale, rock, roadway pavement and all unforeseen obstacles.

Construction In or Under Embankments. Where pipe sewers are to be placed within or beneath an embankment, and the upper extremity of the pipe will be less than 3 feet (1m) below the surface of the original ground, the embankment shall be constructed to an elevation of at least 3 feet (1m) above the upper extremity of the pipe, or to the surface of the completed embankment if less than 3 feet (1m) above the upper extremity of the pipe, before trenching for the pipe. The trench shall then be excavated to the minimum width necessary for placing the pipe and proper backfilling. The pipe shall be laid and the trench backfilled before additional embankment is placed thereon.

Open Cuts. All excavations shall be made in open cuts or trenches except where tunnelling and jacking and boring is required on the Plans. Unless so required, no tunnelling, jacking and boring will be permitted except by written permission or order obtained from the Engineer before beginning the work in tunnel or jack and bore, and the right is reserved to the City to rescind such order to permit at any time during the progress of the Work. All tunnelling and jacking and boring shall be done in strict accordance with the provisions of 603.

Widths and Depths. Excavation shall be of sufficient width and depth to permit and facilitate construction of The Work to the lines, grades and dimensions shown on the Plans, and for sheeting, bracing, pumping, draining and other construction operations. In construction of pipe sewers, trenches shall be excavated to the widths and depths governed by control dimensions for typical trenches shown on Standard Drawing Acc. No. 49032.

Extra Excavation and Refill. If any excavation is carried below the required depth, the loosened material shall be removed and the Contractor shall fill the extra space with concrete of the same class as that to be used in the bottom of the structure or as specified for bedding on Standard Drawing Acc. No. 49032 without additional cost to the City.

The foundation for the conduit bed shall be firm for its full length. Where unstable material is encountered below the foundation it shall be removed to the depth directed by the Engineer under the conduit and for a width on each side equal to the diameter or span of the conduit and replaced with granular material. Rock or boulders encountered at the conduit bed shall be removed at least 6 inches (150mm) below the bottom of the conduit and replaced with granular material.

The proposed elevations of manholes and pipes and the estimated lengths of pipe may be adjusted by the Engineer during construction.

In case the flow line is changed not to exceed 1 foot (0.3m), or it becomes necessary to remove unsuitable material at the direction of the Engineer in an amount not to exceed 1 foot (0.3m), the same shall be done at the Contract bid price.

When the flow line is lowered more than 1 foot (0.3m) or if it becomes necessary to remove more than 1 foot (0.3m) of unsuitable material below the bottom of the trench, compensation will be provided therefore under 204 and 205.

Length of Openings. The making of all openings shall be under the control of the Engineer, and the length of trench or tunnel which may be opened at any one time shall conform to the limits shown on the Plans or determined by the Engineer.

Sheeting and Bracing. The Contractor shall furnish, place and maintain such sheeting and bracing as may be required by the Site Safety Plan, OSHA requirements, or the opinion of the Engineer, to securely support the sides and ends of the excavations, and to prevent injury to the structure being built or to persons or property. If at any time the City so orders, the Contractor shall install such additional sheeting and bracing as the Engineer may consider necessary, but compliance with such orders or failure on the part of the City to issue such orders shall in no case release the Contractor from his liability for damages resulting from weak or insufficient sheeting, nor from his responsibility for protecting The Work and adjacent property from damage. Voids appearing outside of sheeting shall be immediately and compactly filled with suitable material in a satisfactory manner. Sheeting and bracing may be left in place at the option of the Contractor unless otherwise ordered by the Engineer. Sheeting and bracing shall never be removed until sufficient backfill has been placed to provide ample support to the sides of the excavation as determined by the Engineer. When sheeting is left in place, it must be cut off at least 2 feet (0.5m) below the proposed finished surface. Sheeting and bracing ordered left in place shall be paid for under 626.

Disinfection. If a portion of the excavation consists of putrid or obnoxious material, the Engineer will require such material to be thoroughly and satisfactorily disinfected or deodorized by the Contractor where consideration of the health, safety or convenience of the public, or of the men on The Work requires such action.

603.031 Tunnelling. Sewers shall be constructed in tunnel only when tunnelling is shown on the Plans. Unless so indicated, no tunnelling will be permitted except by written permission or order obtained from the Engineer before beginning the work in tunnel, and the right is reserved by the City to rescind such order or permit at any time during the progress of The Work. All of the details of tunnel construction shall be subject at all times to the approval of the Engineer, and the length of tunnel which may be open at any time shall conform to the limits shown on the Plans or determined by the Engineer. Lumber for sheeting and bracing, or liner plates, must be on the site of The Work before excavation for tunnelling may be commenced. The liner plate diameter shown on the Plans has been determined to permit a maximum mining deviation of three inches (75mm) from true line and grade. Any deviation greater than three inches (75mm) shall be corrected by reaming, so that the pipe may be laid to true line and grade in the tunnel.

One plate in each course of liner plates shall be tapped for a two-inch (50mm) grout nipple closed by a screw plug. Plates with grout nipples shall be staggered circumferentially. The Contractor shall do all grouting necessary to back up liner plates and fill voids. The grouting shall be carried out as directed by the Engineer.

Tunnels shall be constructed in strict conformity with the details shown on the Plans or approved by the Engineer. However, no tunnel shall have a width or height of less than 3 feet (1m) inside of the sheeting or liner plates. The sides and roof of the tunnel shall be firmly held in place by such sheeting and timbering or liner plates as may be required to fully protect the structures and the workmen, and prevent settlement of pavements, walks, curbs, buildings, or other structures. If at any time the City so orders, the Contractor shall install such additional sheeting, bracing or other supports as the Engineer may consider necessary, but compliance with such orders or failure on the part of the City to issue such orders shall in no case release the Contractor from his liability for damages resulting from weak or insufficient supports, nor from his responsibility for protecting The Work and adjoining property from damage. Voids between the tunnel lining and top and sides of the excavation shall be immediately and compactly filled with suitable material in a satisfactory manner. Sheeting boards shall be wedged tightly against the top and sides of the excavation, and the haphazard sheeting and bracing of tunnel walls and roof will not be permitted. The completed tunnel lining shall be kept as near as practicable to the working face and at no time shall be more than 6 feet (2m) from the face of the tunnel. Should soft or running material be encountered in excavation, the face shall be kept sheeted and braced and the main sheeting shall be driven ahead of the excavation. Under such conditions, it may be necessary to install liner plates with the use of a needle beam. Under extreme conditions, it may be necessary for the Contractor to furnish and use a tunnel shield.

The Contractor shall leave in place the liner plates or sheeting and bracing of all tunnels without extra compensation.

All tunnels shall be ventilated adequately and lighted sufficiently to insure proper construction and inspections.

Tunnel backfill shall consist entirely of concrete containing a maximum of 12 cu. ft. (0.34m^3) of aggregate per sack of cement, mixed to a zero slump and well compacted after placing. The concrete shall contain a minimum of three sacks of cement per cubic yard (4 sacks per m^3) of concrete. The top portion of the concrete backfill shall be rammed tightly against the top and sides of the tunnel lining.

Payment for sewers constructed in tunnel will be made in accordance with the provisions of the pertinent 603 Conduit item, and in addition, the price bid per linear foot shall cover and include furnishing and placing sheeting and bracing or liner plates disposing of the excavation and furnishing and placing concrete for tunnel backfill.

603.04 Bedding. The conduit bedding shall conform to one of the classes specified. When no bedding class is specified the requirements for Class B bedding shall apply.

Class A. Bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B. Bedding shall consist of a bed of granular material having thickness as shown on Standard Drawing Acc. No. 49032.

The layer of bedding material shall be shaped to fit the conduit for at least ten per cent of the vertical diameter of the conduit and shall have recesses shaped to receive the bell of bell-and-spigot pipe.

603.05 Laying Conduit. Except where otherwise directed by the Engineer for special conditions, the conduit shall be laid starting at the outlet end with the bell or groove end laid upgrade. The lower segment of the conduit shall be in contact with the shaped bedding throughout its full length. Metal conduits shall be placed with longitudinal laps or seams at the sides and by lapping the circumferential seams on the inside in the direction of flow.

All Type A conduits shall begin and end with pipe ends as normally fabricated by the manufacturer. If field cutting is found to be necessary, the cut end shall be located at an interior joint and cradle, collar, or band shall be provided to assure a stable joint.

707.03 structural plate corrugated steel structures shall be erected in accordance with the requirements of 522.03.

706.02 reinforced concrete pipe with elliptical reinforcement and 706.04 reinforced concrete horizontal elliptical pipe with single cage reinforcement shall be handled and placed with the reinforcement markings along a vertical plane. 706.03 reinforced concrete pipe with auxiliary supports shall be handled and placed with the center line of the auxiliary support system in a vertical plane.

Where called for on the plan, conduits shall be encased with specified thickness of Class C concrete meeting the requirements 511. Payment for furnishing and placing the concrete encasement and for any additional excavation required shall include in the unit price bid for the conduit to which it applies.

Pipe shall be laid on a dry trench, and only in the presence of the Inspector.

Curves having a radius of ten or more times the internal diameter of the pipe for sewers 30-inch (0.75m) and larger may be built of radius pipe cast to fit the curve. The center of the first radius pipe must come within one foot (0.3m) of the point of curvature even though it requires the cutting of pipe.

The contractor shall conduct his operations so as to maintain at all times sewer flows through existing facilities to be replaced until new facilities are completed and placed in use.

603.06 Joining Conduit. The method of joining conduit sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even. Sealed joints shall be provided for all Type B, Type C, Type H and Type I conduits. Sealed, banded or bolted joints shall be provided for all Type A, Type D and Type G Conduits. Type F Conduits shall be jointed with coupling bands which match and mesh with the corrugations of the pipes, bands with projections, i.e. dimple bands, shall not be used. Type E Conduits shall have open joints.

Bituminous pipe joint filler may be used only on pipe 30-inch (0.75m) in diameter or rise, or smaller. The bell and spigot ends of the pipe shall be cleaned and then primed with an approved asphaltic primer 24 hours before pipe is laid.

Bituminous pipe joint filler shall be used to coat the tongue and groove in sufficient quantity to completely fill the joint when the pipe is placed in its final position. After the pipe has been placed in its final position, the joint shall be pointed and troweled to form a smooth transition on the inside and a complete seal on the outside.

When bell-and-spigot pipe is used, a gasket of jute shall be placed in each joint and properly caulked so as to leave room for the joint material. All dirt or cement shall be removed from the inside of the pipe and joints left smooth after lying. When joints are of cement mortar type, the jute gasket shall be wet with cement grout before placing. Cement mortar shall be placed in the bottom of the joint, before laying the next pipe, in sufficient quantity to properly fill the joint when the pipe is in position. After setting to line and grade the joints shall be completely filled with stiff cement mortar, composed of one part of cement to two parts of clean, sharp sand, thoroughly pushed in by hand. All surplus joint material shall be removed from the inside and a neat bevel shall be troweled on the outside of the joint. In lieu of the cement mortar, bituminous pipe joint filler on sizes indicated above, or other tested and approved joint materials may be used provided it has been demonstrated that they will make durable, tight joints. If two or more joints are jointed and sealed into units before placing, they shall be tested with a straight edge to insure proper alignment and grade. When plant applied joint materials are used, the use of a jute gasket will be waived. Resilient and flexible gasket joints, 706.11 or 706.12, may be used in lieu of bituminous or cement mortar joint filler.

When corrugated steel pipe is used the coupling bands shall be as specified in 707.01 or 707.02. Coated coupling bands shall be used with coated pipe.

When cast iron or ductile iron pipe is used for gravity sewers, joints shall be a push-on type; Tyton, Super Bell-tite, or approved equal.

When cast iron or ductile iron pipe is used for force mains or pressure sewers, mechanical joints shall be used.

When resilient and flexible gasket joints are specified, the joints shall be those specified or permitted under 706.11 or 706.12.

When portland cement mixtures are used, the completed joints shall be protected against rapid drying by suitable covering material.

Conduit shall be inspected before any backfill is placed. Any pipe found to be out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced.

603.07 Shop Strutting. Where required by the plans a round flexible pipe shall be elongated by increasing its vertical diameter 5 per cent. Where required by the plans the vertical elongation shall be maintained by horizontal wire struts that shall be left in place until the embankment is completed. These struts shall then be removed as directed by the Engineer.

603.08 Backfilling. Backfilling shall cover the replacing of the excavated materials after the sewers and other structures have been built, and the proper grading and shaping of the surface of the backfill. No backfill shall be placed over completed sewers and structures until they have been inspected and approved. No backfill shall then be placed without permission from the Engineer. Pipe sewers shall be backfilled immediately after they have been inspected and approved. Backfilling operation shall be prosecuted as The Work progresses and shall be kept completed as near to the end of the completed sewer as practicable.

Material for backfilling shall be free from rubbish, muck, or other unsuitable materials. Stones and shale exceeding one-half cubic foot (0.15mm^3) in volume shall not be used in the backfill and stones and shale that are used shall be separated by at least six inches (150mm) of earth.

When corrugated metal pipe is used, the fill material shall be free of rocks, frozen lumps, foreign matter and particles in excess of 3 inches (75mm) in size. Local site material is adequate if sufficiently compacted at controlled moisture content. Highly plastic silts and clays, organic silts and clays and peats shall not be used as backfill materials. Backfill material must be placed below the haunches of the pipe and tamped to the specified density. Additional 6" (150mm) to 8" (200mm) layers shall be placed on each side of the pipe and compacted. Puddling or jetting to achieve backfill compaction shall not be permitted.

All conduits, except Type E, shall be backfilled evenly on both sides of the pipe and to a minimum depth of one foot (0.3m) above the pipe for the full width of the trench with bank run gravel placed in layers and pneumatically tamped. In placing and tamping the initial backfill around the pipe sewer, care must be taken not to disturb the line and grade of the pipe. Stepping on or working over pipe sewers shall be held to an absolute minimum until they have been covered with the initial backfill.

When the top of the trench is above the top of a Type A, Type B, Type H, or Type I conduit, the backfill material above the initial backfill shall be granular, and it shall be compacted to the top of the trench in layers not to exceed 4 inches (100mm) in thickness with mechanical tampers.

Bank Run Gravel (703.11) or Controlled Low Strength Material (CLSM) shall be used above initial backfill when:

1) the trench is under what will be used as pavement or driveway;

2) any part of the trench is within 2 feet (0.6m) of the edge of pavement; and

3) in crossings of pavement or driveway extending at the angle of repose.

Granular material may be compacted with water if satisfactory drainage is provided for the free water. When compacting with water, the granular material may be placed in layers not to exceed 12 inches (0.3m) loose depth and each layer thoroughly s saturated with water by flooding or jetting. In lieu of the above requirement for backfilling the full depth of the trench with granular material, portions of deep trenches more than 4 feet (1.2m) above the top of the conduit may be backfilled with suitable soil or granular embankment material provided that such portions of the trench are sufficiently wide to accommodate the use of heavy compaction equipment, and further provided that such equipment is used and all requirements of 203 pertaining to embankment construction are met.

When the top of a Type A or Type B conduit is above the top of the trench and is not in a proposed embankment, proper embankment material shall be placed and compacted for a width on each side of the conduit, equal to at least twice the diameter of the conduit, or 12 feet (3m), whichever is less, and for a minimum depth of 3 feet (1m) over the top of the conduit. One diameter or 4 feet (1.25m) on each side of the conduit, whichever is less, shall be granular material and shall be compacted in layers not to exceed 4 inches (100mm) in thickness with mechanical tampers. The remainder of the embankment material shall meet the requirements of 203.

When the top of a Type C, Type D, Type F or Type G conduit is above the top of the trench and is not in a proposed embankment, the procedure outlined above shall be followed, except that granular material will not be required.

The backfill above the initial backfill for Type D, Type F and Type G conduits shall consist of suitable soil or granular material placed in layers not to exceed 4 inches (100mm) in thickness and compacted with mechanical tampers. The compaction required for soil shall be as required by 203. Granular material may be compacted with water if satisfactory drainage is provided for the free water. When compacting with water, the granular material may be deposited in ponded water or it may be placed in layers not to exceed 12 inches (0.3m) loose depth and each layer thoroughly saturated with water.

The backfill above the initial backfill for Type C conduit shall consist of suitable soil or granular material and shall be finally consolidated by thoroughly jetting with water. Trenches over 14 feet (4m) in depth shall be consolidated by jetting in two (2) equal layers. For jetting other than granular material, a hose not smaller than 1-1/2 inch (40mm) in diameter and a nozzle not smaller than 1 inch diameter and not shorter than 2/3 the depth of the trench carrying water at a minimum pressure of 40 pounds per square inch (psi) (300KPa) shall be inserted into the backfill in a uniform pattern to obtain maximum consolidation. After the final jetting of the trench, the backfill shall be left to settle and to permit drainage of impounded water. Typical jetting procedure shall include a water removal system, either natural or mechanical at intervals not to exceed 500 lineal feet (150m) of trench. Settled trench surfaces shall then be brought to grade by filling with approved fill material and compacted to a density equal to that of adjacent ground.

The backfill the above the betting for Type E conduits shall consist of suitable granular material which shall be tamped.

The backfill above the bedding for Type E conduits shall consist of suitable granular material which shall be tamped solidly under and around the pipe to a height above the flow line equal to two-thirds of the diameter by the use of proper tools. The backfill to a depth of 12 inches (0.3m) above the top of the pipe shall be carefully thrown in with shovels and

not dumped or shoved directly into the trench. This part of the backfill shall not contain stones larger than 4 inches (100mm) in diameter. If the granular material, in the judgment of the Engineer, is of a composition such that it will enter the joints of the pipe, the joints shall be wrapped with strips of tarred paper, or tarred burlap 4 inches (100mm) in width and backfill material packed around the paper or burlap to prevent its displacement. No additional compensation will be paid for the above operation.

When the crown of the sewer is less than 3 feet (1m) below the ground surface, a uniform embankment shall be constructed over the sewer to a minimum depth of 3 feet (1m) above the crown. Excess excavated material may be used for this purpose, but if that is not sufficient, the Contractor will be required to furnish additional material without cost to the City.

The surface of all backfill shall be neatly and evenly graded to conform to the existing ground.

No sheeting or bracing will be removed until sufficient backfill has been placed to provide ample support for the sides of the excavation as determined by the Engineer. Cavities exposed by, and voids resulting from the removal of sheeting shall be thoroughly backfilled with suitable material.

Lightweight dozers and graders may be operated over culverts having 2 feet (0.6m) of compacted cover, but heavy earth moving and compaction equipment shall not be operated closer than one pipe diameter on each side of the conduit, or 6 feet (2m), whichever is less, until a cover of 4 feet (1.2m) has been placed and properly compacted over the top of the Conduit.

Payment for backfilling shall be included in the unit price bid for various pipe items.

603.09 Clearing Site and Restoring Damaged Surfaces. After the backfilling has been completed, the Contractor shall immediately remove and dispose of all surplus materials including dirt and rubbish, as prescribed in 203. Unless otherwise called for on the plans, the Contractor shall replace all pavement, sidewalks, sod or other surfaces disturbed, to a condition equal to or better than that existing before the work was started,or as specified in the "Street Restoration Book", furnishing all materials, labor, equipment, etc.

Where construction crosses private property, such work shall be done in conformity with all agreements between the City and the owners, and the Contractor is presumed to have examined these agreements before submitting his Proposal. Whether or not such an agreement exists, the Contractor shall replace or restore in a good and professional manner, all property removed, damaged, or destroyed by the Contractor's operations in accordance with the following provisions:

(1) All work or requirements as noted on the Plans or called for in the Special Provisions shall be fulfilled.

(2) All fences, walks, driveways, utility or sewer lines, buildings or other structures removed, damaged or destroyed by the Contractor shall be replaced or restored. All trees, shrubs, bushes and other landscaping improvements shall be protected, replaced or restored except where they lie within the permanent right of way. Where a line of shrubs or hedges crosses a permanent right of way, it shall be considered a fence and must be restored as provided in the first sentence of this paragraph.

(3) Where the work is in an area maintained as a lawn, garden, playfield, fairway, etc., the top soil shall be removed and kept separate. For restoration, the surface of the area disturbed shall be graded, stones removed, harrowed and covered with a minimum of 100mm (4 inches) of acceptable topsoil, then handraked, fine graded, and similar vegative cover restored.

(4) Where the work is in an area such as a pasture, meadow, or cultivated field, the top soil shall be removed and kept separate. For restoration, the surface of the area disturbed shall be graded, stones removed, harrowed and topsoil replaced.

(5) When the work is in a ravine or other rough terrain, the premises shall be left in a neat and orderly condition by the removal of rubbish, construction materials and equipment, and by the grading, removal or leveling off of surplus excavation.

All work under this item shall be done by the Contractor without cost to the City and shall be included in the price bid for the various items of work.

603.10 Reconstructing Conduits. Where so required by the plans, existing pipe salvaged under 202 shall be used in constructing conduits of the types and at the locations specified. All of the provisions of these specifications shall govern the reconstruction of conduits with the same materials and by the same methods as the construction of new conduits, except for the furnishing of new pipe.

603.11 Methods of Measurement. The length of conduit to be paid for will be the actual number of linear feet measured from center to center of appurtenant small structures or between open ends inclusive of lengths of pipe bends and branches. Where the location of an appurtenance or an open end is changed with the approval of the Engineer to accommodate full conduit sections, the length will be measured to the plan location or the changed location, whichever results in less cost to the City. Conduits with beveled or skewed ends will be measured along the invert. No deduction will be made for catch basins, inlets or manholes that are 5 linear feet (1.5m) or less across when a conduit is repaired on storm sewers, the length of conduit to be paid for shall be the actual number of linear feet (m) measured from the internal face of the appurtenant structure to the point of connection with the existing conduit. When the location of an appurtenance is changed, the length of conduit shall be measured to the internal face of the appurtenance. Conduits with bevelled or skewed ends will be measured along the invert. Where the length of the conduit to be repaired is the entire distance between two appurtenances, the measurement shall be made from the internal face of one structure to the internal face of the other structure.

The number of tee branches and bends to be paid for will be the actual number ordered and installed as provided in 603.023 and 063.024.

603.12 Basis of Payment. The accepted quantities of conduit of the sizes and types specified will be paid for at the contract unit prices bid per foot (meter), complete in place. The number of tee branches and bends ordered and accepted will be paid for at the contract unit prices bid.

Payments will be made under:

Item	Unit	Description
603	Foot (meter)	___ " Conduit, Type___
603	Foot (meter)	___"X___" Conduit, Type___
603	Foot (meter)	___"Conduit reconstructed, Type___
603	Each	T-branches

603	Each	Bends

ITEM 604 - MANHOLES, CATCH BASINS, INLETS, INSPECTION WELLS, JUNCTION CHAMBERS OR MONUMENTS

604.01 Description. This work shall consist of the construction of manholes, catch basins, inlets, inspection wells, junction chambers or monuments of the types and sizes specified, the reconstruction of existing manholes to grade, remodeling the bottom of existing manholes; or the adjustment of existing castings to grade, as specified.

604.02 Materials. Materials shall be:

Structure concrete	499 & 511
Brick and masonry units	704
Precase reinforced concrete manhole riser sections	706.13
Preformed expansion joint fillers	705.03
Reinforcing steel	509.02
Frames, grates, covers	Purchasing Spec. No. 11-34 (Latest Edition)
Manhole steps	O.S.H.A. Standards (Latest Edition)

Resilient and flexible gasket joints	706.11
Curing materials	705.05, 705.07 Type 2 705.08 Type 2

604.03 Construction Methods, General. The construction for the item specified shall conform to the plans and be placed at the locations and elevations shown or ordered, except that the height of any unit may be changed. If the height of manholes is changed more than 1.2m (four feet), compensation or deductions for the work involved, whether increased or decreased, will be paid for under 602. Where it is necessary to construct catch basins or inlets over 1.2m (four feet) in depth, changes in the depth of walls will be paid or credited for under 602.

The Contractor shall supply all castings. Submittal under Item 106.10 may be required as directed by the Engineer. In addition to other requirements, all inlet castings shall be bicycle safe type.

Cast iron frames, tops and covers of the type called for on the Plans shall be set in full beds of mortar and in accordance with the lines and grades given by the Engineer. Castings shall be properly sloped and set in conformity with the existing pavement surface, or so the new pavement and curbs may be constructed as shown on the Standard Drawings.

Manhole frames shall be fastened to the manhole using at least four stainless steel anchors--20mm x 125mm (3/4" x 5").

Grills for wing wall inlets must be furnished by the Contractor and shall be fabricated from single refined wrought iron bars (ASTM A-189) as shown on the Standard Drawing on file in the office of the Engineer. The grills shall be given two coats of good quality black asphaltic paint, one coat to be applied immediately after fabrication and the other coat to be applied after installation.

Any existing walks disturbed during the construction of catch basin and inlets, shall be replaced at the expense of the Contractor in such manner as to conform in all details to their original construction unless the building of new walk is included in the Work.

All connections for lateral sewers including drops and leads, except pipe included in 603, will be considered a part of all manholes, inlets and catch basins. 150mm (six inch) or 200mm (eight inch) drain tile, 706.07 or 706.09 shall be furnished and placed by the Contractor in manholes, catch basin and inlets for sub-grade drainage, where and as directed by the Engineer and will be considered a part of all manholes, inlets and catch basins.

Adequate precautions shall be taken to prevent concrete and/or mortar from freezing. Brick, concrete block, etc., having temperature of 5°C (40°F) or less shall not be set with mortar until heated for a period sufficient to insure a temperature of 10°C (50°F) to 25°C (80°F) throughout the entire mass of the material.

Special care shall be exercised to prevent the entrance of earth or debris into the pipe line connecting with the manhole, catch basin, inlet or junction chamber. All such earth or debris resulting from construction operations shall be removed from the pipe line.

Butyl mastic seals shall be used at manhole joints and at adjusting rings. See Acc. No. 49037.

When reconstruction of a manhole is specified, the work shall consist of the removal of the domed section of the existing manhole and reconstruction of the manhole to the new grade, conforming as nearly as practicable to the existing dimension and type of construction, reusing the salvaged castings or using new castings.

When remodeling the bottom of existing manholes is specified, the work will generally consist of constructing a new manhole invert to facilitate a change in pipe size, slope, elevations or sewer alignment. The new bottom shall be constructed of brick or formed concrete masonry and shall be as shown on Standard Drawing Acc. No. 49004.

When adjustment to grade is specified, the work shall be accomplished by one of the following methods:

a) When adjusting existing manholes, catch basis or inlets to grade, the old casting shall be removed and remodeled to allow installation of a Precast Concrete Adjusting Ring in accordance with Acc. No. 49058-A. Only if the Engineer grants permission shall the brick and mortar method shown on Acc. No. 49058 be used.

b) Carefully remove the existing cover or grate and furnish and install an approved adjusting ring or casting. The adjusting ring or casting shall be installed to grade insuring that no depressions or variations in grade occur.

604.04 Excavation and Backfill. The excavation shall be of such dimensions in all cases as will give ample room for construction. The removal of any obstruction, which is necessary, shall be done by the Contractor at no additional cost to the City.

Should it be necessary to resort to blasting, the Contractor will be required to take all necessary precautions to protect the work already completed and the adjacent property, and he shall be responsible for any and all damage to the work or to adjacent property. Before blasting, the Contractor must apply and pay for a permit from the City Engineer.

If the material found at grade is not suitable for foundation, a further depth shall be excavated and filled with suitable material. Payment shall be as provided in 603.03.

The proposed locations of manholes, catch basins and inlets may be adjusted by the Engineer during construction. If the flow line is changed more than 0.3m (one foot), compensation or deductions will be provided therefore under 204 and 205. Any changes in such facility locations must be reviewed by the City Engineer before deviating from plains.

The backfilling shall follow the completion of the work as closely as the type of construction will permit. Special care must be taken not to disturb the work.

Excavations in streets which are paved or are to be paved, shall be backfilled as specified for backfill above the initial backfill for Type B Conduit in 603.08.

Excavations not located within 0.6m (2 feet) of street shall be backfilled as specified for backfill above the initial backfill for Type C Conduit in 603.08.

All surplus from excavation shall be disposed of in accordance with 203 before laying in the mortar.

Channels in the bottom of manholes shall be formed as shown on the Standard Drawings or as directed by the Engineer. Both the channels and benches shall be lined with vitrified brick or formed concrete masonry.

In constructing walls of manholes, the brick shall be laid radially in a full bed of mortar with interior joints not more than 6mm (1/4") wide. Every seventh course shall be laid as stretchers, the intervening courses being laid as headers. As the wall is laid up, manhole steps shall be anchored in the masonry as shown on the Standard Drawings. Stubs shall be placed in the wall of the manhole to accommodate inlet and other pipes entering the manhole. These stubs shall be supported with brick masonry corbeled out from the side of the manhole, as shown on the Standard Drawing. In lieu of this corbeling, the Contractor may support the pipe with brick or concrete masonry extending down to the bottom of the

excavation. The upper portion of the manhole shall be domed as shown on the Standard Drawings, the walls being gradually drawn in until the inside diameter is 0.6m (2 feet). The interior joints shall be neatly pointed up and the surface cleaned of all surplus mortar. Outside joints shall be entirely filled with mortar and the surface plastered with a mortar coat 12mm (1/2 inch) in thickness.

Masonry joints shall be protected from freezing for a period of five (5) days.

Brick masonry shall not be permitted in junction chambers.

604.06 Precast Solid Concrete Block. Concrete blocks shall be laid as specified for brick masonry under 604.05, except that concrete blocks shall not be used in construction of manholes and junction chambers.

604.07 Precast Concrete Rings. Joints in precast rings shall be sealed as prescribed under 603.

604.08 Concrete (Cast-In-Place). Concrete of the classes specified shall be as set forth under 499 and 511.

604.09 Method of Measurement. The number of manholes, catch basins, inlets, monument assemblies, monument boxes or junction chambers will be the actual number of each, completed and accepted.

604.10 Basis of Payment. The work in' 'ded in this item, including excavation, backfill, hauling and setting castings, furnishing interceptor inlet castings and grills for wing wall inlets, reinforcing steel, where specified, restoration not included under conduit installation and for other incidentals necessary for completion of the items, shall be paid for at the contract price, complete in place.

Item	Unit	Description
604	Each	Manholes
604	Each	Inlets
604	Each	Catch Basins
604	Each	Monument assemblies or monument boxes
604	Each	Manholes, catch basins, inlets or monument boxes adjusted to grade (a. Brick Masonry)
604	Each	Manholes, catch basins, inlets or monument boxes adjusted to grade (b. Adjusting Ring or Casting)
604	Each	Remodel bottom of existing manholes
604	Each	Manholes reconstructed to grade
604	Each	Junction chambers

ITEM 608 - WALKS, CURB RAMPS AND STEPS

608.03 Concrete Walks. The following sentence shall be added to part (a) of this section:

Wherever the proposed concrete sidewalk adjoins or abuts an existing sidewalk the existing sidewalk shall be sawed and trimmed to a neat line.

608.031 Painting Tree Grates and Guards.

Description. The Contractor shall furnish all paint, tools, labor, and incidental materials, clean the surfaces and apply the paint as specified.

Material. The following list of paint types are accompanied with Foy-Johnson Paint Company numbers to form a basis of quality. Metal primer - Rust-T-Bond Composite type 9804, Exterior enamel (a). Beige - 29804 and (b). Char Brown - 39842 or equivalent.

General. The surfaces to be painted shall be clean and dry. Paint shall not be applied in rain, snow, fog, or mist, or to frosted or ice coated surfaces. Apply materials smoothly, spread or flow on evenly, free from runs, snags, brush marks, or other defects. Treat defective surfaces and sand all surfaces between coats of paint. Allow preceding coat to dry thoroughly before applying succeeding coat. Minimum time between coats is 24 hours, if faces are of uniform texture, color, and sheen.

No coating shall be thinned more than specifically recommended in the manufacturer's printed directions and thinner used shall be of highest type of those recommended. No coating ready - prepared for use shall be thinned without the approval of the Engineer. All auxiliary materials, such as linseed oil, shellac, turpentine, etc., shall be pure, of highest quality and approved by the engineer. Such materials shall bear identifying labels on the containers.

All coatings shall be applied by brush or roller unless spray application is specifically named as acceptable in description of required treatment. Coatings shall be thoroughly stirred and kept at a uniform consistency during application. Excess paint, thinner, or other auxiliary materials shall be disposed of properly.

608.032 Enlarging Expandable Tree Grates

Description. The Contractor shall furnish all labor, tools, material and equipment necessary for enlarging tree grates including removing the tree grate, notching the radial spokes, breaking off the unwanted portions, and resetting the grate.

Construction. Remove both halves of the tree grate and, using a pneumatic or electric cutting wheel or grinder, notch halfway through the surface of the grate where it is intended to be enlarged. When notching is completed, support useable portion of grate on a solid surface with notched areas approximately one half inch off the edge of solid surface. Strike the unusable portion of the grate with a hammer and fracture each notch separately. After the unusable portion is removed, use a grinder to smooth rough edges. Reinstall grate to original position. Special care must be taken to protect tree and surrounding surface. Any tree or grate damage caused by this work must be corrected or compensated for by the contractor as determined by the Urban Forest Manager.

608.033 Installing New Tree Grate Into Existing Tree Grate Frame

Description. This item shall include furnishing all labor, material, equipment and services required for the installation of a new tree grate or half of a tree grate into an existing tree grate frame. May include adding washed pea gravel, if gravel settling has occurred.

Materials. Tree grates shall be of cast iron and conform to A.S.T.M. A-48-83 Class 35 or better, manufactured by Neenah Foundry Company, or equivalent. Neenah grates are distributed locally by Neenah Foundry Company, 1077 Celestial Street, Cincinnati, Ohio 45202. Pea gravel shall be washed and free of all debris.

Paint and Primer. New grates may require paint and primer, if directed by the Engineer.

Installation. Backfill to one inch below grate seat with washed pea gravel. Clear all debris from grate seat prior to setting grate. Grate shall be set flush with the top of the frame. Grate halves shall be bolted together on the underside when bolt slots are provided. Special care must be taken to prevent damage to the tree. Any tree damage caused by this work must be corrected or compensated for by the Contractor as determined by the Urban Forest Manager.

608.08 Method of Measurement. Add the following sentences: The painting of grates and guards shall be paid for at the contract unit price bid for each one half grate, which will be full compensation for all labor, material, and equipment necessary to perform work described above.

The enlarging of the tree grates shall be paid for at the contract unit price bid per one half grate, which will be full compensation for all labor, material and equipment necessary to perform work described above.

Furnishing and installing tree grates will be paid for at the unit price bid per one half grate which shall constitute full compensation for all labor, tools, material, and equipment necessary, including proper backfilling.

608.09 Basis of Payment. Add the following items: Payment will be made under:

Item	Unit	Description
608	Each	Painting Tree Grates and Guards
608	Each	Enlarging Expandable Tree Grates
608	Each	Installing New Tree Grate Into Existing Tree Grate Frame

ITEM 609 - CURBING

609.01 Description.

The following sentence shall be added to this section:

The curbing shall be constructed in strict accordance with the Standard Drawings on file in the City Engineer's office which show the details of construction for the various types of curbs.

609.04 Cast-in-Place.

The following paragraph shall be added to this section:

The curb form shall conform exactly to the curb dimensions. Forms of greater or lesser height will not be permitted.

(e) Restoration adjacent to curb shall include backfill, compaction, Soil Renovation consistent with Item 654 and Sodding consistent with Item 660. The Contractor shall adhere to the provisions of Item 660.08 Watering.

609.08 Basis of Payment. The following phrase shall be added to the first sentence of this section:

regardless of whether the curb depth is uniform or of varying height.

ITEM 614 - MAINTAINING TRAFFIC

1. The Contractor shall perform the required work with the least inconvenience to, and the maximum safety of, the Contractor and the traveling public. Any variances from these Maintenance of Traffic notes must be approved in advance in writing by the Engineer. Except as modified below, the requirements for maintaining traffic, as indicated in the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways," and the City of Cincinnati Traffic Safety Handbook (Blue Book) current editions, latest revisions, and pertinent items of specifications and proposal shall apply.

2. In addition to Item 614, "Maintaining Traffic," as set forth in the State of Ohio Department of Transportation Construction and Material Specifications, the following notes shall also apply to the work carried out within the limits of this project.

    a) The Contractor will be required on an interim and permanent basis to provide, erect, maintain (in proper position, clean, legible and good working condition) and remove all lights, signs, barricades and all other traffic control devices necessary to the maintenance of traffic. This also includes all advance warning signing and regulatory signs. All signs shall be reflectorized or illuminated. Type "B" flashing barricade warning lights shall be installed with every advance warning traffic control device.

b) The standard device for closing any lanes to traffic shall be properly weighted, reflectorized, 30 gallon or 55 gallon drums. Tapers for lane closures shall have reflectorized drums spaced 50 feet (15m) apart with construction arrows (OW-138) mounted on the first, fifth, and last drums.

c) An electric flashing arrow board of a type shown on Standard Construction Drawing TC-35.10 shall be installed in each taper closing a lane to traffic, centered in the closed lane.

d) Type "C" steady burning barricade warning lights shall be installed every 150' (50m) in the tapers for nighttime lane closures.

3. If the Contractor desires to work weekends or nights, prior approval of the Engineer is required.

4. If temporary signs which restrict parking are installed, the local Police District must be notified and the signs must be posted at least 14 hours before the parking restriction listed on the sign.

5. Access to abutting properties must be maintained at all times. Police and fire access must be maintained at all times.

6. No excavations shall be allowed unattended without adequate coverings. In addition, red lighting shall be provided for protection overnight.

7. All vehicles, equipment, workers and their activities are restricted at all times to one side of the pavement, unless otherwise approved by the Engineer. Vehicles and equipment shall always move with, and not across or against, the flow of traffic. Vehicles and equipment shall not park or stop except within designated areas, and shall enter and leave work areas in a manner which will not be hazardous to, or interfere with, the normal flow of traffic. Personal vehicles will not be permitted to park within the right-of-way except in specific areas designated by the Engineer.

8. Pedestrian protection and pedestrian access must be maintained at all times. Pedestrian safety is of utmost importance throughout the life of the contract. Pedestrians must be directed to the safest crossing point at all times, and their safety is the responsibility of the Contractor.

9. If the services of an off-duty police officer are needed, these services must be furnished by the Contractor. Please call the Cincinnati Police Division, phone 352-2583.

10. To assure maintenance of adequate traffic control at all times, no signs are to be installed or removed without the approval of the City Traffic Engineer and the Project Engineer. The Contractor may be required to submit a Maintenance of Traffic Plan, subject to review before implementation.

11. Before any work begins, the Contractor shall submit to the Engineer the names and telephone numbers of a person or persons who can be contacted 24 hours a day by the City of Cincinnati and all interested police agencies. This person or persons shall be responsible for placing or replacing necessary traffic control devices to safely maintain the traveled pavement.

12. The Contractor will be required to give at least seven days notice to the Engineer prior to the closure of any lane.

13. Steady burn warning lights shall be required for drums or barricades.

614.05 Basis of Payment. Add:

6. Temporary Pavement Markings

ITEM 619 - TEMPORARY FACILITIES

619.04 Temporary Facilities

619.04 Temporary Facilities. Where provided in the Special Provisions or the Bid Sheet the Contractor shall provide an Allowance in the amount indicated for providing things needed by the City for the administration of the Contract. From time to time during the duration of the Contract, the Engineer will direct the Contractor to obtain and provide services, materials, equipment, supplies or work that is not covered by other terms of the contract. These may include Project Signs, Portable Telephones, Field Office Telephone, Trailer Rental, utilities, office supplies or equipment and safety equipment. Specific brands or vendors may be directed unless the Contractor can demonstrate that some other brand or vendor can fulfill the City's need with respect to timeliness, quality, cost, quantity and utility. The Contractor will be allowed a markup not to exceed 10% for all things so provided to cover costs for labor and materials including pickup, delivery and in the case of project signs installation, maintenance and return to the City.

Item	Unit	Description
619	Lump Sum	Temporary Facilities Allowance

ITEM 626 - SHEETING AND BRACING ORDERED LEFT IN PLACE

626.01 Description

626.02 Method of Measurement

626.03 Basis of Payment

626.01 Description. This item shall provide for payment only for sheeting and bracing left in place if shown on the Plans or in compliance with a written order from the Engineer. All sheeting and bracing left in place shall be cut off on a line two feet below the existing or proposed street surface, or one foot below the existing or proposed ground surface if not within the street right-of-way.

No payment will be made for waste material, for material cut off, for the excess size of unnecessarily large timbers. Sheeting and bracing left in place at the option of the Contractor, and sheeting and timbering left in tunnel will also not be paid for under this item.

The right of the City to order sheeting or bracing left in place shall not be construed as an obligation upon the City to issue such orders, nor does the compliance with such orders or failure on the part of the City to exercise its right to issue such orders, release the Contractor from his responsibility for any damage caused by his operations, nor from his responsibility to protect the work and adjacent property.

626.02 Method of Measurement. The quantities measured shall be the number of board feet of sheeting and bracing ordered left in place or left in place as shown on the Plans. Sheeting will be considered to be two inches thick, unless heavier sheeting is ordered.

626.03 Basis of Payment. Payment for accepted quantities left in place in accordance with this specification will be made at the contract price bid per 1000-foot board measure (MFBM) which shall cover all the labor, materials and equipment required to furnish, install and cut off the sheeting and bracing for:

Item	Unit	Description
626	MFBM	Sheeting and Bracing Ordered Left in Place

ITEM 627 - DRIVEWAYS

627.01 Description

627.02 Construction Methods

627.03 Method of Measurement

627.04 Basis of Payment

627.01 Description

This work shall consist of the construction of portland cement concrete driveways or portland cement concrete base and asphaltic concrete surface driveways wherever ordered by the Engineer and in accordance with Section 721-133 of the Cincinnati Municipal Code.

The concrete for driveways shall be Class C conforming to the requirements of 499. The concrete driveways shall be 7 inches thick. The concrete base and asphaltic concrete surface driveways shall be composed of a 7-inch base and 2-inch surface course. Both shall be of the length and width ordered by the Engineer.

The driveways shall be constructed in strict accordance with the Standard Drawings on file in the Engineer's office which show the details of construction along the various types of curbs.

627.02 Construction Methods.

Excavations shall be made and the subgrade shall be evenly fine graded and solidly compacted with a 5 ton roller. Where the use of a roller is impractical, the subgrade shall be compacted by heavy tamping. Forms may be of either steel or sound 2-inch plank, and they shall be straight, true and clean. The forms shall be set true to line and grade, firmly staked down and well braced. Concrete shall be placed in accordance with the requirements of 451.06 and shall be given an even and uniform broom finish. Preformed expansion joint filler 1/2 inch thick shall be placed on both sides between the driveway and the curb. If the driveway is over 30 feet long, the joint filler along the curb shall be 1 inch thick. The expansion joint filler shall meet the requirements of 451.02 and shall be depressed 1/4 inch and sealed as provided in 451.13.

Concrete driveways shall be cured in strict accordance with the provisions of 451.10.

The asphalt concrete surface course shall conform to the same specifications and requirement as prescribed in 404.

627.03 Method of Measurement. Driveways will be measured by the square foot of finished surface complete in place.

627.04 Basis of Payment. The accepted quantities of specific items of concrete driveway and concrete base and asphaltic concrete surface driveway will be paid for at the contract prices designated for each of the pay items listed and shall cover all the labor, materials, and equipment required to construct the driveways complete including excavation, preparation of the subgrade, construction of expansion joints, curing of concrete and placing asphaltic concrete surface.

Payment will be made under:

Item	Unit	Description
627	Square Foot	Concrete Driveway
627	Square Foot	Concrete Base and Asphaltic Concrete Surface Driveway

ITEM 628 - SAWING CONCRETE

628.01 Description

628.02 Method of Measurement

628.03 Basis of Payment

628.01 Description. This work shall consist of the sawing of concrete, except when sawing is included under other items of the work, to a minimum depth of 1-1/2 inches where called for on the Plans or in the Special Provisions or Proposal or where ordered by the Engineer. The saw cuts shall be carefully made in a neat manner with an approved concrete saw. Concrete damaged by the sawing operations shall be repaired by the Contractor to the satisfaction of the Engineer without cost to the City.

628.02 Method of Measurement. The footage to be paid for shall be the actual number of linear feet of concrete sawed to the required depth as called for on the Plans, Special Provisions or Proposal or where ordered by the Engineer, completed and accepted.

628.03 Basis of Payment. The footage measured as provided above shall be paid for at the contract unit price bid which price and payment shall constitute full compensation for sawing concrete according to the provisions of these Specifications and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item	Unit	Description

628 Linear Foot Sawing Concrete

ITEM 629 - CURBS RESET

629.01 Description

629.02 Construction Method

629.03 Method of Measurement

629.04 Basis of Payment

629.01 Description. This work shall consist of the resetting of existing curbs to the line and grade of the new improvement. Only curbs in good condition shall be reset and those will be designated by the Engineer. If necessary, the ends of the old curbs shall be redressed so as to make a joint not exceeding 1/4 inch (6mm) wide for a distance of 12 inches (.3m) down from the top.

629.02 Construction Method. After the subgrade of the street has been roughly finished, the curbs shall be set true to line and grade with the face vertical. The trench for the curb shall be excavated to a depth of 22 inches (559mm) below curb grade and to a width of 10 inches (254mm) back from the curb line. After the trench has been thoroughly cleaned of all loose material, a layer of stiff concrete shall be spread on the bottom and the curb adjusted and tamped to correct line and grade. Additional concrete shall then be placed back of the curb to a depth of 8 inches (203mm) from the top and shall be well spaded and tamped. Class "C" concrete having aggregate not exceeding 1-1/2 inches (38mm) in size shall be used for curb setting. After the concrete has cured, the remaining space back of the curb shall be filled with fine earth tamped to solid compaction.

Where driveways are required, the curbs shall be omitted or lowered to the extent directed by the Engineer. The projecting ends of the adjoining curbs shall be neatly trimmed off as shown on Standard Drawing Acc. No. 21508. Portland cement concrete walks and concrete base disturbed in the resetting of the curbs shall be restored, under the direction of the Engineer, without special compensation.

629.03 Method of Measurement. The footage measured will be the actual number of linear feet of curb reset.

629.04 Basis of Payment. The accepted quantities of curb reset will be paid for at the price bid per linear foot which shall cover all the labor, materials, and equipment required to reset the curbs complete, including excavation, moving the curbs, if required, and concrete for bedding, backing and restoration of the base.

Payment will be made under:

Item	Unit	Description
629	Linear Foot(m)	Curbs Reset

ITEM 635 - CUTTING AND TRIMMING OLD GRANITE CURBS

635.01 Description

635.02 Method of Measurement

635.03 Basis of Payment

635.01 Description. This work shall consist of the cutting and trimming of old granite curbs which are spalled or otherwise damaged, so that they will be fit to reset in the new improvement. When so ordered, the Contractor shall cut and form new ends on damaged curbs. Ends shall be squared and dressed so as to afford joints not exceeding 1/4 inch wide for a distance of 12 inches down from the top of the curb.

635.02 Method of Measurement. The number of newly dressed ends will be the actual number of cuts made regardless of whether a cut produces one or two new ends.

635.03 Basis of Payment. Payment for the accepted quantity will be made at contract price for:

Item	Unit	Description
615	Each	Cutting and Trimming Old Granite Curb

ITEM 636 - BICYCLE RACK - TYPE A

636.01 Description

636.02 General

636.03 Materials

636.04 Fabrication

636.05 Finishes

636.06 Construction

636.07 Method of Payment

636.08 Basis of Payment

636.01 Description.

This item shall include the furnishing of all materials and the necessary labor to construct and erect the completed bicycle rack of the type specified. Anchors, foundations, connections, shimming and finishes are a part of this item.

636.02 General.

The line and grade of the bicycle rack shall be true to that shown on the plans. Flange mounted racks shall be shimmed vertical.

Rack Type shall be designated "Type A-capacity-mounting-finish." Capacity is 2 or 4. Mounting includes flange (F)or embedded post foundation (X). Finish includes galvanized (G), stainless (S), or TGIC powder coating (T).

636.03 Materials.

Bicycle rack materials shall conform to the following:

Concrete, Class C	499
Concrete pad	608
Steel pipe	707.08
Steel Base Plates	ASTM A36, 730.09
Anchor bolts	ASTM A36
Stainless Steel Pipe	730.09
Stainless Steel Hardware	730.10
Foundations	630.05

636.04 Fabrication.

Bicycle racks shall be fabricated out of steel pipe, nominal diameter, Schedule 40. The pipe shall be bent in a one piece as shown on the standard drawing. The bicycle rack shall not be welded in sections. The base plate and cross bar shall be fabricated in accordance with the standard drawing and continuously welded to the steel pipe prior to finishing. The entire unit shall be finished as specified.

636.05 Finishes.

TGIC powder coat finish—Steel shall be cleaned to near white steel and treated with iron phosphate pre-treatment. Primer shall be thermosetting epoxy powder coating (Corvel Zinc Gray 13-7004 or approved equal), applied electrostatically, cured approximately 6 minutes at 250°F (120°C). Thickness shall be 1.8-2.2 mils (46-56μm). Topcoat shall be Triglycidyl Isocyanurate (TGIC) Polyester powder coating, applied electrostatically, cured in oven for approximately 20 minutes at 250°F (120°C). Top coat shall be 1.8-2.2 mils (46-56μm) thick. Color shall be black unless otherwise specified on plans.

Galvanized racks shall be hot-dipped galvanized after fabrication per ASTM A123.

Stainless steel racks shall be polished to #4 Architectural or satin finish after fabrication.

634.06 Construction.

Foundations for bicycle racks shall be located by the Contractor and staked at the proper location in accordance with the plans. Where no locations or dimensions are given on the plans, the City will provide the staking.

Prior to excavation, the Contractor shall check for underground obstructions. After stakeout, the Contractor shall notify the Engineer at least three days before the scheduled work so that the rack locations may be field checked by the Engineer for approval. The Engineer may change the bicycle rack location due to underground obstructions or lateral clearance

requirements. After approval, the Contractor shall be responsible for the correct location and orientation for all rack foundations.

Excavation for foundations may be performed by earth auger; however, in areas of underground utilities, excavation shall be by hand labor.

Anchors shall be internally threaded epoxy system anchors, 12 mm (1/2") bolt size as manufactured by Epcon or approved equal. Installation shall conform to the manufacturer's instructions. Anchors shall be capable of developing an ultimate load capacity in tension of 900 kg (2000 pounds). On structural slabs, anchors shall penetrate no more than 3/4 of the way through the slab.

Existing walks and structural slabs shall be core drilled for flange mounting using anchors and prepared in accordance with the manufacturer's instructions. Flange mounted racks shall be shimmed vertical, perpendicular to the rack.

636.07 Method of Measurement.

The quantity of bicycle racks will be for each type of bicycle rack installed. Anchors, excavation and concrete for foundations shall not be measured separately. Walk removal, concrete pads and concrete pavers installed for bicycle racks shall be measured and paid for separately.

636.08 Basis of Payment. Payment will be made at the contract unit price bid for each Bicycle Rack Type A, which will be full compensation for all labor, equipment, tools, and incidentals necessary for each item furnished complete, in place, and accepted. Payment will be paid under:

Item	Unit	Description
636	Each	Bicycle Rack Type A

ITEM 657 - RIPRAP FOR TREE PROTECTION

657.02 Stone

657.03 Tree Wells in Fill

657.02 Stone. Delete limestone.

657.03 Tree Wells in Fill. In first paragraph change 12 inches (0.3m) to 4 inches (0.1m).

The following paragraph shall be added to this sub-section.

Construction of a tree well mandates that:

1. Soil is aerated in accordance with 658.
2. Tree is pruned to Class I standards of the National Arborist Association (666.011).
3. Tree is fertilized according to National Arborist Association Standards (666.011).

ITEM 658 - TREE ROOT AERATION

658.02 Aggregate

658.04 Preparation

658.041 Installation of Tile

658.05 Aeration for Trees Not Welled

658.06 Aeration with Tree Wells

658.08 Method of Measurement

658.09 Basis of Payment

658.02 Aggregate. The aggregate for tree root aeration and protection shall be No. 4 or No. 467 coarse gravel or stone of a neutral pH.

658.04 Preparation. The following paragraph shall be added to this sub-section:

Mechanized equipment, other than a hand or small riding lawn mower may not be used. This work shall be done by hand. The top soil and humus layer shall not be disturbed. Tree shall be pruned and fertilized as per 657.03.

658.041 Installation of Tile. Earth fills greater than 12 inches require the construction of a tile aeration/watering system. Tile lines shall be constructed at the base of the aggregate aeration course radiating from the well wall to the periphery of the tree branches in a pattern similar to the spokes in a wagon wheel. Eight tile lines shall be installed per tree in a fill that completely surrounds the tree. Tile will penetrate the well wall. At the periphery end of each tile line the line shall take a right angle to the surface of the fill and terminate with a bell shaped tile with vented cover at grade. This vertical column shall be held in place with a sufficient amount of cobble sized stone to hold it securely until the aggregate aeration course and earth fill are properly in place.

658.05 Aeration for Trees Not Welled. Delete this sub-section.

658.06 Aeration with Tree Wells. Earth filled greater than 4 inches (0.1m) shall require tree root aeration. The 4 inch (0.1m) fill requires a 2 inch (50mm) aggregate aeration course. At no time must fill or aggregate be placed within a tree well or touching the trunk of the tree. Aggregate shall be one half depth of fill up to fills of 12 inches (0.3m).

658.08 Method of Measurement. Add to last sentence.

and the tile lines shall be measured by the linear foot (m) including vertical line and bell tile with cover.

658.09 Basis of Payment. Add the following to this sub-section.

Item	Unit	Description

658	Foot (meter)	Tile line aeration system

ITEM 660 - SODDING WITH TOPSOIL

660.04 Preparation of Areas to be Sodded

660.10 Basis of Payment

660.04 Preparation of Areas to be Sodded. Before the sod is placed, the sod bed will have been excavated to such a depth so as to allow a layer of topsoil, which will be at least 3 inches (10mm) in depth when compacted, to be spread and at a grade which will assure that the surface of the sod after tamping will conform to the grade indicated on the plans or directed by the Engineer. Topsoil shall meet the requirements of Item 653 of the State of Ohio Specifications. When specified under 659, commercial fertilizer and agricultural liming material shall be applied and incorporated in the areas to be sodded at the rate specified in 659.08 to a depth of not less than 1 inch (25mm), and not more than 48 hours before the sod is placed. Immediately prior to the placing of the sod, the area shall be raked, or otherwise brought to an even surface forming a proper sod bed, and if dry, the sod bed shall be thoroughly watered previous to placing of the sod.

660.10 Basis of Payment. Payment for accepted quantities including the furnishing and placing the topsoil will be made at contract price for:

Item	Unit	Description
660	Square Yard (m^3)	Sodding with Topsoil

ITEM 661 - PLANTING VINES

661.04 Mulching Material

661.06 Nursery Stock

661.08 Inspection

661.15 Layout of Planting

661.251 Guarantee Period

Wherever applicable, the words "ground cover" may be substituted for vines.

661.04 Mulching Material. Delete the last sentence and add the following sentence.

The chips need not be aged.

661.06 Nursery Stock. The following sentences shall be added to the first paragraph:

Unless otherwise specified, all stock shall be furnished from an active nursery. Active nursery shall be defined as a currently maintained nursery. Nursery stock which has been allowed to degenerate into a wild state shall be classified as "collected stock" and shall not be accepted. Collected stock is defined in ODOT Specification 662.06.

661.08 Inspection. The following paragraph shall be added to this section:

Transportation costs to the nursery for inspection by the Engineer shall be provided by the Contractor. In the event that distances are too great, color photographs of plant material under consideration shall be required and furnished by the Contractor.

661.15 Layout of Planting. The following paragraph shall be added to this section:

In the event that subsurface utilities or other unknown obstacles are encountered during construction of the project, the Contractor shall immediately inform the Engineer in order to adjust planting location of vines.

661.251 Guarantee Period.

All planting shall be guaranteed to remain alive and healthy for a period of one year from the acceptance date as established in writing by the Engineer. The one-year guarantee period shall span two planting seasons. The acceptance date shall be established after an inspection concurring that all stock is satisfactorily planted and that all related construction is satisfactorily completed. Any replacement stock shall be covered by a new one-year guarantee period.

ITEM 662 - PLANTING SHRUBS

662.02 Material

662.04 Nursery Stock

662.07 Ball and Burlap

662.09 Inspection, Labeling, Certificates and Rejection of Plants

662.12 Layout of Planting

662.13 Roots and Top Pruning

662.16 Peat Moss

662.201 Guarantee Period

662.02 Material. Delete reference to Paint (for wounds).

662.04 Nursery Stock. The following sentences shall be added to the first paragraph:

Unless otherwise specified all stock shall be furnished from an active nursery. Active nursery shall be defined as a currently maintained nursery. Nursery stock which has been allowed to degenerate into a wild state shall be classified as "collected stock" and shall not be accepted. Collected stock is defined in ODOT Specification 662.06.

662.07 Ball and Burlap. Add the following sentence to the end of the paragraph:

Burlap and associated rope or twine shall be rotta B6; no plastic, nylon or other material treated with preservative shall be used.

662.09 Inspection, Labeling, Certificates and Rejection of Plants. The following paragraph shall be added to this section:

Transportation costs to the nursery for inspection by the Engineer shall be provided by the Contractor. In the event that distances are too great, color photographs of plant material under consideration shall be required and furnished by the Contractor.

662.12 Layout of Planting. The following paragraph shall be added to this section:

In the event that subsurface utilities or other unknown obstacles are encountered during construction of the project, the Contractor shall immediately inform the Engineer in order to adjust planting location of shrubs.

662.13 Roots and Top Pruning. Delete the last sentence.

662.16 Peat Moss. When peat moss is specified, it shall be thoroughly spaded or otherwise worked into the sub-soil and all backfill.

662.201 Guarantee Period.

All planting shall be guaranteed to remain alive and healthy for a period of one year from the acceptance date as established in writing by the Engineer. The one-year guarantee period shall span two planting seasons. The acceptance date shall be established after an inspection concurring that all stock is satisfactorily planted and that all related construction is satisfactorily completed. Any replacement stock shall be covered by a new one-year guarantee period.

ITEM 663 - PLANTING TREES

663.02 Material

663.05 Nursery Stock

663.08 Size of Plants

663.10 Inspection, Labeling, Certificates and Rejection of Plants

663.111 Delivery

663.13 Layout of Planting

663.14 Roots and Top Pruning

663.171 Guarantee Period

663.18 Wrapping

663.19 Bracing

663.191 Protection from Vandalism

663.02 Material. Replace first sentence with the following:

Topsoil, peat moss and mulch shall conform to 662.02.

663.05 Nursery Stock. The following sentences shall be added to the first paragraph:

Unless otherwise specified all stock shall be furnished from an active nursery. Active nursery shall be defined as a currently maintained nursery. Nursery stock which has been allowed to degenerate into a wild state shall be classified as "collected stock" and shall not be accepted. Collected stock is defined in ODOT Specification 662.06

663.08 Size of Plants. The first sentence shall read as follows:

Deciduous trees shall be specified by caliper and shall indicate the minimum and maximum caliper measurement taken 6 inches above the collar.

663.10 Inspection, Labeling, Certificates and Rejection of Plants. The following paragraph shall be added to this section:

Transportation costs to the nursery for inspection by the Engineer shall be provided by the Contractor. In the event that distances are too great, color photographs of plant material under consideration shall be required and furnished by the Contractor.

663.111 Delivery.

Trees shall be completely covered by a tarpaulin during transit to prevent drying out of branches, trunk, and earth ball of roots. To avoid possibility of the earth balls being cracked or broken during transit, the trees shall be loaded with the balls forward on the truck and the trunks tilted back and secured by proper blocking. Proper tying with other ropes adequate to secure the load is also required. Trees which have been shipped without covering or arrive with cracked or broken earth balls shall not be accepted.

663.13 Layout of Planting. The following paragraphs shall be added to this section:

In the event that subsurface utilities or other unknown obstacles are encountered during construction of the project, the Contractor shall immediately inform the Engineer in order to adjust planting location of trees.

663.14 Roots and Top Pruning. The ends of all broken and damaged roots of 1/4 inch diameter or larger shall be pruned with a clean cut removing no more than the injured portion. Pruning shall be done as prescribed in 666.03. Pruning shall conform to the Class I Standards of the National Arborists Association and Z133.1 Safety Standards (666.011). A sample tree of each species, variety and size shall be acceptably pruned, a department seal placed thereon to remain throughout the life of the Contract, the sample to be a guide for subsequent pruning

663.171 Guarantee Period.

All planting shall be guaranteed to remain alive and healthy for a period of one year from the acceptance date as established in writing by the Engineer. The one-year guarantee period shall span two planting season. The acceptance date shall be established after an inspection concurring that all stock is satisfactorily planted and that all related construction is satisfactorily completed. Any replacement stock shall be covered by a new one-year guarantee period.

663.18 Wrapping. Add the following sentence to the paragraph:

Contractor shall remove from each tree and dispose at his expense all wrapping and jute twine at the end of the guarantee period (663.171).

663.19 Bracing. The following shall be added after the word planting:

According to methods illustrated on Sheet L-2 of the Ohio Department of Transportation Standard Construction Drawing, or a two or three stake method as directed by the Engineer. In most cases with limited planting space, the two stake method shall be required. When plating adjacent to a curb, walk, or street, the stakes shall be set parallel to the curb, walk, or street in a neat and uniform appearance. The tree shall be guyed to each stake by means of number 11 gauge galvanized wire cut to adequate length to pass doubled from stake around tree and back to the same stake. The wire shall pass through a piece of 5/8" rubber or fabric hose, cut to uniform lengths, to protect the tree trunk.

All evergreen trees shall be braced immediately after planting. Any deciduous tree that leans during the life of the contract shall immediately have its planting hole soil ball, backfill and mulch areas thoroughly soaked with water, than, when the soil is loose and slippery, the tree shall be straightened and braced.

663.191 Protection from Vandalism

Whenever indicated on the plans for trees that are to be caged, they shall be caged by the three stake method. The three stakes shall be set in a circle with a diameter of 1 ft. 4 in. and 120° apart. The stakes shall be 2-1/8 in. x 1 in. x 7 ft. universal steel stakes, and driven 2 ft. 6 in. into the ground. A 4 ft. 6 in. section of a 4 ft. wide roll of 1" x 1" galvanized welded wire mesh shall be fastened to each stake in three places. The bottom of the cage shall have a uniform clearance of 6 inches above the ground. The tree shall be guyed to each stake by means of number 11 gauge galvanized wire cut to adequate length to pass doubled from stake around tree and back to the same stake. The wire shall pass through a piece of 5/8" rubber fabric hose, cut to uniform lengths, to protect the tree trunk.

ITEM 664 - PLANTING SALVAGED PLANTS

664.02 Materials and Construction Methods

664.02 Materials and Construction Methods. Add the following sentence to the paragraph

Prior to digging, each tree shall be marked on the north side of the truck with a small spot of paint and during transplanting each tree shall be again oriented to due north. Each plant salvaged shall be dug and handled in full compliance with A.N.S.I. Z60.1 standards with the earth ball size stated therein being considered the minimal acceptable size.

ITEM 665 - LARGE TREES MOVED AND RESET

665.02 Material

665.09 Commercial Fertilizer or Peat Moss

665.14 Top and Root Pruning

665.16 Wrapping

665.17 Bracing

665.19 Dead Trees

665.20 Watering and Maintenance

665.02 Material. Remove wound dressing from first sentence. Change second sentence to read:

Commercial fertilizer shall conform to that recommended in the National Arborist Association Standards (666.011).

665.09 Commercial Fertilizer or Peat Moss. Peat moss shall be uniformly mixed with Top Soil (661.02) at the rate of 15% Peat Moss and 85% top soil by volume. Added to this shall be a slow release, granular 5-10-5 or similar high phosphorous fertilizer at the rate of 10 pounds per cubic yard of topsoil/peat moss mixture. This topsoil/peat moss/fertilizer mixture shall be used exclusively as the backfill (665.13).

665.14 Top and Root Pruning. Delete second sentence and add the following sentences:

The tops of all trees shall be pruned in compliance with Class I standards of the National Arborist Association and A.N.S.I. Z133.1 Safety Standards (666.011). At the direction of the Engineer specified branches directly interfering with traffic or pedestrians shall be removed.

665.16 Wrapping. Add the following sentence to this paragraph:

At the end of the guarantee period the Contractor shall remove and dispose of, at no expense to the City, all wrapping and twine.

665.17 Bracing. The following sentence shall be added after the first sentence in the first paragraph:

Whenever the tripod guy type system is used in areas of pedestrian traffic, the wires shall be made conspicuous to prevent accidents and liabilities. This shall be done by placing yellow plastic tubing of uniform and sufficient length over the doubled wires.

Add the following paragraph as the last paragraph of this subsection:

At the end of the guarantee period the Contractor shall remove and dispose of, at no expense to the City, all bracing and guying materials.

665.19 Dead Trees. Add the following sentence to this paragraph:

All replacement trees shall carry an additional guarantee period identical to the first tree. The contract shall be extended to include this additional guarantee period.

665.20 Watering and Maintenance. Add the following sentence to the end of the paragraph

Watering and maintenance shall be performed on any replacement tree (665.19).

ITEM 666 - PRUNING EXISTING TREES

666.011 Pruning & Safety Standards

666.02 Wound Dressing

666.03 Pruning

666.04 Painting

666.05 Removal of Foreign Materials

666.06 Removal of Rubbish

666.07 Permit

666.011 - Pruning & Safety Standards. All pruning and other tree work shall conform to two standards.

a. National Arborist Association standards for pruning of shade trees, guying of shade trees, fertilizing of shade and ornamental trees, lightening protection installation systems for shade trees and pesticide application procedures.

b A.N.S.I. Z133.1 - Safety Requirements for Tree Care and Removing Trees and Cutting Brush.

Copies of both of these standards are currently on file at the City's Urban Forest Management Office.

666.02 Wound Dressing. Tree would dressing shall not be used unless a designated brand is specified to reduce sucker sprouting stimulated by recent pruning on certain tree species.

666.03 Pruning. All pruning shall conform to the two standards specified in 666.011. In addition, the Engineer may order that specific branches be removed to minimize interference with traffic or pedestrians. Pruning shall also include the removal of any plant material including vines within 3 foot radius of trunk.

666.04 Painting. Painting shall conform to 666.02.

666.05 Removal of Foreign Materials. All nails, spikes, bolts, wire or other foreign materials driven into or fastened to the trunk or branches of the tree shall be removed or pruned following the standards stated in 666.011.

666.06 Removal of Rubbish. Add the following sentence to the paragraph:

This work shall be completed within 2 hours of the time the tree is pruned.

666.07 Permit. Before any work is undertaken within 5 meters (15 feet) of any tree within the right-of-way under any Contract or Permit, the Contractor shall obtain a Public Tree Work Permit from the Urban Forester. Any conflict between the contract requirements and the Urban Forester's requirements shall be brought to the attention of the Engineer for resolution.

ITEM 667 - SEEDING AND JUTE MATTING

667.03 Construction

667.04 Maintenance

667.06 Basis of Payment

667.03 Construction. In second and third paragraphs, change all references to 6 inch slots to 12 inch slots.

Add the following sentence to the end of the third paragraph:

Where netting is used in drainage ditches or swales, check slots shall be spaced so that one check slot or one end occurs within each 25 feet of slope.

Add the following sentence to the end of the fifth paragraph.

Where matting is used in drainage ditches or swales, all ends of the matting and all check slots shall be stapled across their width, with staples spaced not more than 2 inches apart.

Delete sixth paragraph.

667.04 Maintenance. The matting areas shall be maintained for six months after the completion and acceptance of all other work on the contract. Maintenance shall consist of the repair of areas damaged by erosion, wind, fire or other causes. The soil in such areas shall be restored to the condition and grade existing just prior to application of the matting, and restored areas shall be relimed, refertilized, and reseeded. Where necessary, the jute matting shall be completely replaced.

667.06 Basis of Payment. Add the following:

Item	Unit	Description
667	Square Yard	Seeding and jute matting in drainage ditches and swales.

ITEM 668 - SEEDING AND EXCELSIOR MATTING

668.03 Construction

668.03 Construction. Within 48 hours after the area has been fertilized, and limed if specified, it shall be seeded with the mixture and at the rate as specified in 659.09

Within 48 hours after the specific area has been seeded, excelsior matting shall be installed, held in place and over-seeded as specified for 667.03, except that edge and end overlap shall be 6 inches, and no check slots shall be required. The up-slope end or top edge of each strip need not be buried unless required by the Engineer due to special conditions in the field. The excelsior shall be in contact with the soil. No vegetative mulching material shall be used under the excelsior matting.

ITEM 669 - SEEDING AND OTHER MATTING MATERIALS

669.01 Description

669.02 Materials

669.03 Construction

669.04 Maintenance

669.05 Method of Measurement

669.06 Basis of Payment

669.01 Description. This work shall consist of furnishing, placing, and maintaining seeding and other matting materials on areas as shown on plans and as directed by the Engineer.

669.02 Materials. All materials shall meet manufacturer's specifications and be approved by the Engineer.

669.03 Construction. All materials shall be applied following the manufacturer's specifications.

669.04 Maintenance. The matting areas shall be maintained as described in 667.04 of the City of Cincinnati Supplement.

669.05 Method of Measurement. The yardage of the other matting materials shall be the number of square yards (soil surface area) of the seeding (if required) and matting placed in accordance with the manufacturer's specifications, completed and accepted.

669.06 Basis of Payment. Payment for accepted quantities placed will be made at contract price for:

Item	Unit	Description
669	Square Yard	Seeding (if required) and other matting materials.

ITEM 670 - EROSION PROTECTION

670.01 Description

670.02 Materials

670.03 Construction

670.06 Basis of Payment

670.01 Description. Add the following:

An Erosion Control Plan shall be submitted and approved by the Engineer prior to beginning construction. No construction shall begin until all appropriate erosion control measures are in place.

670.02 Materials. Add the following line:

Seeding and other matting materials.....669

670.03 Construction. Add the following to the first sentence:

and in addition, matting material shall cover at least 75% of slope, ditch or swale.

670.06 Basis of Payment. Add the following to this sub-section:

New and useful matting materials are coming on the market often. Straw, coconut, fiberglass and paper strip matting, each requiring slightly different installation procedures, are now in place in Hamilton County. Some even come with their own grass seed and fertilizer. Use of any material other than as specified must be reviewed by the Engineer before use.

No specific item must be included for payment of erosion control measures. Erosion control measures may be paid as part of other construction items.